CLAIMS :

1. A type of particulate reinforced aluminum-based composite which comprises reinforced particles and aluminum alloy, wherein:

 (1) the reinforced particles are dispersively and uniformly distributed in an aluminum alloy matrix, and forms interfacial bonding with the matrix;

 (2) the average particle size of the reinforced particles is 0.1～3.5μm; and

 (3) the volume percentage of the reinforced particles is 10 ～ 40%.

2. A type of particulate reinforced aluminum-based composite as claimed in claim 1, wherein the reinforced particle in question is selected from the group consisting of B_4C, SiC, Al_2O_3 and AlN.

3. A type of particulate reinforced aluminum-based composite as claimed in claim 1, wherein the aluminum alloy is selected from the group consisting of forged aluminum, duralumin and super duralumin.

4. A type of particulate reinforced aluminum-based composite component, wherein the component is made from a billet of the particulate reinforced aluminum-based composite as claimed in claim 1.

5. A method of forming a type of particulate reinforced aluminum-based composite component comprising the steps of:

 (1) according to a desired volume percentage of reinforced particles in an aluminium-based composite, determining a weight percentage of the required reinforced particles;

 (2) based on the required weight percentage of reinforced particles in the composite, determining a required weight of the reinforced particle and corresponding weight of an aluminum alloy powder;

(3) loading required amounts of reinforced particles, Al-based alloy powder and steel balls into a balling drum of a high-energy ball-mill, then carrying out high-energy ball-milling to form a composite powder;

(4) adding liquid surfactant, and continuing with ball-milling;

(5) molding the composite powder into a desired shape through cold isostatic pressing;

(6) processing the cold isostatic pressed shape into a compact billet by means of vacuum sintering or vacuum hot-pressing; then

(7) heating the compact billet, and undertaking semisolid die-cast forming to produce a near net shape composite component.

6. A method as claimed in claim 5, wherein the volume percentage of reinforced particles is 10～40% and the weight percentage of reinforced particles is 9.3～50.9%.

7. A method as claimed in claim 5, wherein high-energy ball-milling is performed for 1～10 hours and a ball to power weight ratio is 10-50:1.

8. A method as claimed in claim 5, where the high-energy ball-milling is divided into a low speed stage wherein a rotational speed is 100～150rpm for 10～40 minutes, and a high speed stage wherein a rotational speed is 150～300rpm for 20～600 minutes.

9. A method as claimed in claim 5, wherein after adding liquid surfactant, ball-milling is continued for 0.5～2 hours within a temperature range of 15～80°C.

10. A method as claimed in claim 5, wherein the compact billet has a density of 70～80% of its theoretical density, and is formed by applying a pressure of 20～1000 MPa for 1～10 minutes.

11. A method as claimed in claim 5, wherein the vacuum sintering or vacuum hot-pressing is carried out at a temperature of 450～600°C, pressure of 36～700Mpa and vacuum degree of not less than 1.5 x 10^{-2} Pa.

12. A method as claimed in claim 5, wherein the compact billet is heated to 600～660°C to reach a 60～70% liquid phase content.

13. A method as claimed in claim 5, wherein the reinforced particle is selected from the group consisting of B_4C, SiC, Al_2O_3 and AlN.

14. A method as claimed in claim 5, wherein the aluminum alloy is selected from the group consisting of forged aluminum, duralumin and super duralumin.

15. A method as claimed in claim 5, wherein the average size ratio between the said reinforced particle and the Al-base alloy powder can be selected randomly within a range of 0.1～100μm/10～210μm.

16. A method as claimed in claim 5, wherein the steel balls are high-carbon steel balls of Φ5～Φ8mm.

17. A method as claimed in claim 5, wherein the balling drum is first vacuumized to a vacuum degree of 0.1～10Pa, then an inert gas of nitrogen or argon is added at a pressure of 1.01x10^5Pa～1.1×10^5Pa, and the balling drum undertakes high-energy ball-milling with cooling of 5～25°C.

18. A method as claimed in claim 5, wherein the amount of the added surfactant is 10 — 50ml.

19. A method as claimed in claim 18, wherein during the ball-milling process, the balling drum is first vacuumized to a vacuum degree of 0.1～10Pa, then an inert gas of nitrogen or argon is added at a pressure of

$1.01 \times 10^5 Pa \sim 1.1 \times 10^5 Pa$, and the balling drum undertakes high-energy ball-milling without cooling.

20. A method as claimed in claim 5, wherein the particle size range of the composite powder after the high-energy ball-milling is 10—120μm.

21. A method as claimed in claim 5, wherein the added surfactant is an organic solvent selected from the group consisting of gasoline, aviation gasoline, methanol and ethanol.

22. A method as claimed in claim 5, wherein the compact billet is shaped by means of semisolid die-casting after it is heated.